N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

http://hdl.handle.net/2027.42/64943
Research Design

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN
Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**
- A → B
- Pressure → Ulcer

**Multicausality**
- Years smoking → Heart disease
- High fat diet → Heart disease
- Limited exercise → Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
• Controlling the treatment
  
  o Choose a treatment based on research and practice
  o Develop a protocol for implementation
  o Document the implemented treatment
  o Use a check-list to determine the extent of completeness to which the treatment was implemented
  o Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?
- No
- Yes

Is the primary purpose examination of relationships?
- No
- Yes

Descriptive Design
- Will the sample be studied as a single group?
  - No
  - Yes

Quasi-Experimental Study
- Will a randomly assigned control group be used?
  - No
  - Yes

Is the original sample randomly selected?
- Yes

No
- Yes

Experimental Study
Selecting a Descriptive Design

Examine sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Cross-sectional design
    - Yes
      - Studying events partitioned across time?
        - No
          - Trend Analysis
        - Yes
          - Repeated measures of each subject

    - Yes
      - Single unit of study
        - No
          - Longitudinal Study
        - Yes
          - Case Study
A Typical Descriptive Design

Clarification  ➔  Measurement  ➔  Description  ➔  Interpretation

Variable 1 ➔ Description of Variable 1

Variable 2 ➔ Description of Variable 2

Variable 3 ➔ Description of Variable 3

Variable 4 ➔ Description of Variable 4

Interpretation of Meaning

Development of Hypotheses

Phenomenon of Interest

Research Design
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses

Group II
{variables measured}

Describe
Selecting the Type of Correlational Design

- Describe relationships between/among variables?
  - Descriptive correlational design

- Predict relationships between/among variables?
  - Predictive correlational design

- Test theoretically proposed Relationships?
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1 ➔ Description of variable ➔ Examination of Relationship ➔ Interpretation of Meaning ➔ Development of Hypotheses

Research Variable 2 ➔ Description of variable
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Experimental Design

- **Pretest**
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
          - Yes
            - Blocking?
              - No
                - Randomized clinical trials
              - Yes
                - Comparison of multiple levels of treatment
                  - No
                    - Examination of complex relationships among variables in relation to treatment
                  - Yes
                    - Nested Designs

Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST → TREATMENT → POST-TEST</td>
<td></td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST → POST-TEST</td>
<td></td>
</tr>
</tbody>
</table>

- **Treatment:** Under control of researcher
- **Findings:**
  - Comparison of pretest and post-test scores
  - Comparison of experimental and control groups
  - Comparison of pretest-post-test differences between samples
- **Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.
- **Uncontrolled threats to validity:**
  - Testing
  - Mortality
- **Instrumentation:** Restricted generalizability as control increases
# Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
<th>POST-TEST</th>
</tr>
</thead>
</table>

| Measurement of independent variables | Measurement of dependent variables |

- **Treatment:** Under control of researcher
- **Findings:** Comparison of experimental and control groups
- **Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
**Pain Control Management**

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit E</td>
</tr>
<tr>
<td></td>
<td>Unit C</td>
<td>Unit F</td>
</tr>
<tr>
<td></td>
<td>Unit D</td>
<td>Unit G</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Nursing Care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Primary Care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design